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Comparison between productive and reproductive performance of Barki and Ossimi ewes under Egyptian conditions

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Abstract

This study aimed to determine the influence of breed and physiological status on productive and reproductive performance, blood metabolic profile, and concentration of some hormones in blood of Barki and Ossimi ewes. Investigations were carried out on 40 healthy ewes belonging to the Bedouin flocks in pastoral areas of Burj Al Arab region, animals aged 3-5 years and weighed 35.0-40.0 kg. Animals were assigned in two equal groups (20 ewes/each) according to their breed (Barki and Ossimi ewes). Ewes were grazed on the natural pasture *(Acacia saligna* and *Atriplex halimus* plants) and supplemented with concentrate feed mixture. Results showed a significant (P<0.05) difference in live body weight between the two breeds (38.83 and 37.35 kg for Ossimi and Barki ewes, respectively). Milk yield, fat, lactose, ash and total solid were not significantly affected by type of breeds.

The effect of breed was significant on RBCs, MCV and MCH, while, physiological status had highly significant effect on RBCs, Ht % and MCH. No significant differences were found between the two breeds in biochemical blood parameters except total lipids. Effect of physiological status was highly significant on albumin/globulin ratio and alkaline phosphatase. For the hormonal pattern, Ossimi ewes had higher level (p<0.05) of insulin concentration than Barki ewes especially during post-partum period. The breed type and physiological status had significant (P<0.05) effects on thyroid hormones, especially thyroxin, as Ossimi ewes showed higher concentration of T_3 and T_4 (1.76 and 40.14 ug/dl) than Barki ewes (1.67 and 38.20 ug/dl), respectively.

Ossimi ewes showed higher (P<0.05) plasma leptin concentration than Barki ewes during different physiological status. Also, in the same trend, Ossimi ewes showed higher leptin concentration in milk than that found in Barki ewes during postpartum days and the differences were significant (P<0.05).

Ossimi ewes showed improve of reproductive performance than Barki ewes, represented in estrus duration, estrus rate, onset of estrous, day of estrous, non-return rate**,** dominant follicle diameter, CL diameter, conception rate, fecundity, kidding rate, reproductive ability, kids born per ewes joined, ewes aborted/ewes conceived, twining frequency and kids weaned/kids kidded compared to Barki ewe**s**. While, the type of breed insignificantly affected fertility. Analysis of variance showed significant variations (P<0.05) in pregnancy duration due to the type of breed. The differences in P_4 concentration between breeds after mating were significant (P<0.05).

Key words: Ossimi and Barki ewes, productive and reproductive performance and blood parameters.

Introduction

In Egypt, raising sheep is a fundamental part of agriculture income, particularly in the arid and semi-arid regions, where animals are adapted to the natural environment and to diversified pastoral resources, as they can make use of low-quality biomass in times of scarcity and transform it into useful products, such as milk, meat and wool, with the ability to pursue these pastures for long distances and to withstand the harsh environmental conditions, especially the native sheep breeds which demonstrate better performance under harsh environmental conditions than their non-native counterparts **(Ibrahim, 2014).** Sheep are the third in terms of their contribution to the provision of red meat in the country after cows and buffaloes, which considered the strategic stockpile of food security that, play an important role as source of milk and meat. In addition, sheep as a source of

meat, milk and wool can contribute significantly to solve the problem of animal protein deficiency, which considered the most important food security problems in the country **(Aboul-Naga *et al.*, 1981)**. Increasing human population challenge food security and evoke the need to explore new resources of food.

The current population of sheep is approximately five million, distributed in Upper and Central of Egypt and in the governorates outside the valley (North and South Sinai, Marsa Matruh, New Valley, Red Sea, Nubaria).

Different physiological status in the animal life such as (pregnancy, parturition and lactation) are important variable which modify metabolism (**Iriadam, 2007**) and affects the concentrations of blood biochemical (**Roubies *et al.*, 2006**), used in assessing nutritional status and animal health (**Antunovic *et al.*, 2009**). Reproduction statuses consider the most critical and stressful periods of dam's life cycle because of high nutritional requirements for fetus, colostrum and milk production (**Sobiech *et al.*, 2008**) where high energy and minerals needed for milk synthesis.

Information about changing biochemical constituents during different reproductive stage is very important to guarantee the metabolic and nutritional needs of ewes and to reduce the mortality rates of newborns and consequently economic loss (**Piccione *et al*, 2009**). Blood biochemical parameters including total protein, triglycerides and urea are important indicators for the metabolic activity in lactating animals. There are certain serum markers useful in assessing the energy status and growth of animals, such as glucose, cholesterol and creatinine (**Karapehlivan *et al.*, 2007).**

The assessment of the relationship between blood biochemical parameters and milk production could clarify the changes in ewe's metabolism during lactation period.

However, the sheep milk contains high protein, fat, and total solids, which involved in many dairy products (**Hilali *et al*., 2011**). Sheep milk products can provide a profitable alternative to cow milk products owing to their specific taste, texture and their natural and healthy image (**Raynal –Ljutovac *et al*., 2008).** Milk yield and composition vary due to breed and the stage of lactation (**Sakul and Boylan, 1992**). Additionally, knowing breed effects on milk yield and composition is very important to implement breeding selection programs based on the traditional quantitative approach (**Carta *et al.*, 2009**).

Leptin is a 16 kDa protein synthesized by white adipose tissue, its secretion and level express the amount of body fat and it involved in regulation of feed intake and energy balance. Thus, serum leptin is sensitive to energy balance and reduce during periods of negative energy balance in sheep (**Tokuda *et al.*, 2001),** which affect fertility and immune functions. In domestic animals, leptin hormone consider as indicator of nutritional status, status of energy reserves and balance, and regulate the appetite, energy metabolism and body composition (**Chilliard *et al.*, 2001)**. The primary role of leptin is regulation of physiological adaptation to starvation (**Barb *et al.*, 2001**). Leptin receptors have demonstrated in hypothalamic regions, regulating appetite, growth and reproduction, indicating the influence of leptin on secretion of various neurotransmitters, neuropeptides and hormones (**Chilliard *et al.*, 2001**). Leptin plays a crucial role in controlling reproduction, as demonstrated by **Houseknecht *et al.* (1998**) in animals carrying mutation in Ob gene encoding leptin (ob/ob mice). It acts directly on gonadotropin secretion, but receptors in ovaries, testes and uterus indicate the additional possibility of direct leptin action on reproduction (**Spicer, 2001**). In sheep, **Spicer (2001**) reported that irrespective of energy status, circulating leptin levels increase during early to mid-pregnancy and remained elevated until late pregnancy then decrease just before parturition where many biochemical and metabolic changes occur due to energy and reproductive changes, that may affect leptin activity (**Forhead *et al.*, 2002**). During lactation, **Block *et al.* (2001)** mentioned that eliminating the energetic costs of lactation by preventing milk delivery in cows caused an increase in plasma leptin level together with an increase in energy balance. This indicates that the fall in circulating leptin level towards and during lactation is due to the energetic costs of milk production. The suckling stimulus itself did not appear to influence the

decrease in leptin concentration (**Brogan *et al.*, 1999**). **Pickavance *et al.* (1998**) observed that food intake induced leptin increase, which was eliminated during lactation and they speculated that the hypoleptinemia may be an important factor promoting the hyperphagia of lactation.

This study aimed to investigate the effect of breed type and physiological status on productive and reproductive performance of Barki and Ossimi ewes.

MATERIALS AND METHODS

Study area: The present study was carried out in Burj Al Arab region in the Western Coastal Region, that lies nearly 45 km southwest of Alexandria (Latitude 30.85º, N, Longitude 29.61º, E), Egypt. This area characterized by average temperatures ranging from 8.63 to 31.61 º C; relative humidity ranging from 49 to 68%; wind ranging from 3.03 to 7.94 m/s and solar ranging from 8.56 to 29.70 MJ/m2.

Animals and management: A total number of forty healthy ewes belonging to the Bedouin flock in pastoral areas of Burj Al Arab region, aged 3-5 years and weighed 35.0-40.0 kg. used in the present experiment. Animals assigned to two equal groups according to breed (Barki and Ossimi). Animals in each group housed in un-shaded yard (20 m length X 20 m width) surrounded with wire fence. Animals went out daily for grazing the natural pasture 5-10 km near the Bedouin houses. Time of grazing started by the first light and continued 3 hours of the day. *Acacia saligna* and *Atriplex halimus* plants were dominant as natural pasture in this region. Fresh water was available to animals in free choice all the day. Body weight changes recorded for each animal. The supplemented diet (concentrate feed mixture) offered to animals after returning from the pasture. Feed requirements calculated according to **Kearl (1982)** during different physiological status. Chemical composition of feedstuffs were determined according to **A.O.A.C. (1990)** and presented in Table (1).

Table (1): Chemical composition of feed stuffs on DM basis.

Ingredient	DM	OM	CP	EE	CF	NFE	Ash
Acacia saligna	84.8	89.4	8.8	2.4	22.3	55.9	10.6
Atriplex halimus	94.27	78.27	12.07	10.28	20.15	35.78	21.73
Concentrate feed mixture	91.42	88.61	15.61	3.01	16.33	53.66	11.39

DM: dry matter, OM: organic matter, CP: crude protein, EE: ether extract: CF: crude fiber, NFE: nitrogen free extract.

1-Blood sampling and biochemical analyses: The blood samples were withdrawn from all ewes of both breeds before feeding and drinking at 8 am during pre-mating, pre-partum and post-partum (on day 1, 15, 30 and 45). About 10 ml of blood collected from the jugular vein of each ewe using heparinized vacutainer tubes. The blood tubes centrifuged at 4000 rpm for 15 minutes after standing at room temperature for 20 min, and the plasma samples were stored in a freezer at -20 ºC for subsequent biochemical analyses. Plasma samples were separated to applying biochemical analyses included aspartate amino transferase (AST), alanine amino transferase (ALT), alkaline phosphatase (ALP), glucose, cholesterol, urea**,** creatinine, triglycerides, total lipid, total protein and albumin using commercial colorimetric kits of ‘‘Diagnostic Products Corporation, (DCP) Los Angles, USA’’ . Globulin calculated by subtraction concentration of albumin from that of total protein then albumin/globulin ratio (A/G ratio) estimated.

2-Hormones determination: Quantitative determination of blood serum was done by using ELISA kits at the Hormonal Unit, Animal Health Research Institute, Dokki, Giza. Leptin analysis carried out by using sheep leptin ELISA kit (SinoGeneClon Biotech Co., Ltd) with catalog number: SG-5010. Insulin was determined by using BIOS (Chemux BioScience, Inc) ELISA kit, catalog number: 10801. Thyroid stimulating hormone thyroxin (T_4) and triiodothyronine (T_3) were determined by using ELISA kit (XEMA Co. ,Ltd , Moscow ,Russia) with catalog number : K201 and k212, respectively. The assay based on a solid phase

enzyme- linked immunosorbent assay with sensitivity: 0.3 ng/L for leptin, 10 ng/ml for progesterone, 0.02 µIU/ml for insulin, 0.01 Ug/dl for T_3 and 3 Ug/dl for T_4, respectively.

Non-coagulated blood tested shortly after collection for estimating blood pictures in dams. White blood cells, red blood cells counted according to **Feldman *et al.*, (2000)**. Concentration of hemoglobin (Hb) carried out using (Super+Ior®, Sahli's method) according to **(Sahli, 1905)**.

3-Milk yield and composition: Daily milk yield (ml) estimated for all ewes of the two groups at the first week of kidding just after colostrum days until weaning. Chemical composition of milk in terms of fat, protein, lactose, total solids (TS) and solids not fat (SNF) were determined using Milk Scan (Bently-Belguim). Leptin concentration in milk measured by RIA as described by **Blache *et al.* (2000)** during the first seven weeks of lactation.

4-Reproductive performance: Ewes naturally mated during breeding season and watched over from mating until parturition.

A-Estrus detection: Detection of estrous started immediately and carried out by exposing ewes to teaser rams three times daily. Ewes were considered in heat when full stand to be mounted by the male. The indicators applied for monitoring estrous characteristics were; duration of estrous (calculated from onset of acceptance until the ewes became non-receptive to rams for mating); onset of estrous; day of estrous (determined as the first day of symptoms seen including ram harness or ewes stand when mounted by the ram).

B-Ovarian activity: Ovarian activities of ewes monitored by using portable sonar. They recorded post mating through counting different types of follicles presented with different size stages. Number and diameter of corpus luteum also recorded.

C-Reproductive traits: The recorded reproductive traits of ewes include; conception rate (CR), as percentage of ewes conceived/ewes joined; fertility, as percentage of ewes kidded/ewes joined; fecundity as percentage of kids born/ewes joined; prolificacy as percentage of kids born/ewes kidded (kidding rate); reproductive ability percentage of kids weaned/ewes kidded; mortality rate and finally percentage of dead kids from birth to weaning.

Statistical Analysis: Statistical analysis was carried out using General Linear Model (GLM) procedures by **SAS (2010)** using simple one-way analysis of variance. Duncan's New Multiple Range Test (**Duncan, 1955**) used to allocate differences among treatment means.

RESULTS AND DISCUSSION

Live body weight of ewes:

Results in table (2) revealed that breed, physiological status and the interaction between breed and physiological status had significant ($P < 0.01$) effect on live body weight as Ossimi ewes showed heavier weight than Barki ewes (38.83 vs. 37.35 kg, respectively). Ewes gradually decreased ($P<0.01$) in weight in both breeds during the postpartum experimental period approaching their weights before insemination. However, both experimental group of ewe breeds' remained apparently in good health throughout the experimentation. These results agree with Ibrahim (2014) who recorded pre-partum losses in ewes weight. He measured the percentage of initial body weight at days 0, 7, 14, 21 and 28 after birth and found them 21.18, 9.92, 3.20, 2.52 and 2.57% for ewes fed Berseem hay, while were 25.02, 8.90, 3.38, 2.24, 2.54 and 3.2% for ewes fed silage made of salt tolerant plants.

Live body weight of newborn lambs:

Table (3) showed body weight, and average daily gain of newborn Barki and Ossimi lambs. Heavier body weight of male lambs in comparison to female lambs at all days postpartum was noticed for the two breeds. Ossimi lambs were significantly ($P<0.05$) heavier than Barki lambs. The average daily gain was not significantly differed between the two tested breeds.

Table 2: Live body weight of Barki and Ossimi ewes monitored during different physiological status.

Item	Breed	Physiological Status				Overall mean	±SE		
		Days post-partum							
		1 days	15 days	30 days	45 days		Br	S	Br x S
Live body weight, Kg.	Barki	36.73^{b}	36.25^{b}	35.48^{c}	34.70^{c}	37.35 ^{B}	0.12**	0.20**	0.29**
	Ossimi	38.18^{a}	37.65^{a}	36.73^{b}	36.15^{b}	38.83 ^{A}			

*, P<0.05, **, P<0.01, NS, non-significant, a, b,c, =Values in the same row within certain trait with different super scripts are significantly differed (P< 0.05), A, B = Values with different letters on the same column differ at (P<0.05).
Br=breed, S = physiological status and Br x S= breed x physiological status.

Table 3: Live body weight of newborn Barki and Ossimi lambs during post-partum period.

Item	Breed	Sex	Days post-partum				Br	Br x D	
			1 days	15 days	30 days	45 days			
Body weight, Kg.	Barki	Male	3.43	5.02	6.40	10.05		0.08NS	M
		Female	2.81	4.44	5.58	7.64		0.15NS	F
	Ossimi	Male	3.88	5.55	6.91	10.47			
		Female	3.12	4.67	5.85	8.39			
Average daily gain, gm.	Barki	Male	0.00	227.55	195.91	285.42	5.19NS	10.38NS	M
		Female	0.00	232.65	163.26	294.49	10.74NS	21.48NS	F
	Ossimi	Male	0.00	238.77	193.87	273.80			
		Female	0.00	208.16	169.38	362.24			

*, P<0.05, **, P<0.01, NS, non-significant, A, B = Values on the same column differ at (P<0.05).
Br=breed, D= days and Br x D= breed x days.

Ibrahim (2014) found that the average birth weight of Barki lambs was 3.69 and 3.05 kg for males and females, respectively. Generally, daily gain reduced at 30 days then growth rate was compensated at 45 d. This mostly due to the short duration of lactation season in both breeds which reflected on the reduced weights at 30 days then recovery of lambs after start feeding. **Ebangi *et al.* (1996)** stated that the higher weight of male in comparison with females could reflect differences in hormonal profiles between males and females during infancy favoring growth rate in the former.

Milk yield and composition of Barki and Ossimi ewes during the experimental period.

Data of milk yield and composition for Barki and Ossimi ewes during neonatal period are shown in Table 4. Milk yield, fat, lactose, ash and total solid were not significantly differed between the two tested breeds but days postpartum significantly (P<0.05) affected milk yield and composition. Barki ewes showed a higher protein percentage than Ossimi ewes (5.24 vs. 4.97%, respectively), while solid not fat percentage was higher in Ossimi ewes than observed in Barki ewes (10.58 vs. 10.10%, respectively). The highest milk yield was observed at day 30 postpartum in both breeds Barki and Ossimi (805.66 and 766.0 ml, respectively). It is necessary to mention that, after attaining the peak, milk yield decreased gradually till the end of the lactation period. In sheep, several factors such as breed, days of lactation, type of feeding, season and milking system affect milk yield and milk composition (**Caja and Bocquier, 2000).** In Barki ewes, **Ibrahim (2014)** found that milk yield was significantly (P<0.05) affected by days after parturition.

Aboul-Naga *et al.* (1981) studied milk yield of Rahmani, Ossimi and Barki ewes and found that Ossimi ewes showed significantly (P < 0·01) higher total milk production than Barki one, milk yield declined sharply for the Barki ewes after the 6th week of lactation and breed variation in milk yield failed to attain significance in the first 4 weeks of lactation.
In the same context, **Hashem and EL-Zarkouny (2016)** found no differences in milk composition due to type of breeds.

Table 4: Mean values of milk yield and composition of Barki and Ossimi ewes during the experimental period.

Item	Breed	Lactation period				Overall Mean	±SE		
		Days post-partum							
		4 days	15 days	30 days	45 days		Br	D	Br x D
Milk Yield, ml	Barki	594.16	601.66	805.66	715.83	679.33	7.99NS	11.31**	15.98NS
	Ossimi	575.00	611.66	766.00	727.83	670.12			
Fat, %	Barki	4.91	5.06	5.25	6.03	5.31	0.07NS	0.09**	0.13NS
	Ossimi	4.88	4.98	5.20	6.02	5.27			
Protein, %	Barki	6.90	5.39	4.55	4.12	5.24^{A}	0.07**	0.10**	0.15NS
	Ossimi	6.50	5.10	4.39	3.90	4.97^{B}			
Lactose,%	Barki	5.60	5.19	4.19	4.13	4.78	0.08NS	0.11**	0.15NS
	Ossimi	5.66	5.28	4.29	4.22	4.86			
Ash, %	Barki	0.81	0.69	0.71	0.77	0.74	0.07NS	0.10NS	0.14NS
	Ossimi	0.92	0.90	0.91	0.88	0.90			
SNF, %	Barki	10.33	10.20	10.11	9.75	10.10^{B}	0.07**	0.10**	0.15NS
	Ossimi	10.84	10.71	10.53	10.25	10.58^{A}			
TS, pg/ml	Barki	18.23	16.34	14.70	15.05	16.08	0.27NS	0.38**	0.02NS
	Ossimi	17.96	16.26	14.79	15.02	16.01			

*, P<0.05, **, P<0.01, NS, non-significant, *A, B* = Values on the same column differ at (P<0.05). SNF, solids not fat: TS, total solid. Br=breed, S = physiological status and Br x S= breed x physiological status.

Milk leptin concentrations:

Fig. (1) show the levels of leptin hormone in the milk of Ossimi and Barki ewes. Data illustrate that Ossimi ewes had higher leptin concentrations than Barki ewes during postpartum weeks and the differences were significant (P<0.05). In both breeds, milk leptin showed increasing trend from the first week of lactation until six weeks after parturition then tended to decrease. This result agree with the finding of **Rasmussen *et al.* (2004)** who found that milk leptin increased after parturition and peaked within 2 days postpartum. **McFadin *et al.* (2002)** mentioned that milk leptin level was not affected by leptin level circulate in plasma. It reported that leptin level was highest in colostrum, and that leptin may accumulated in the mammary gland during colostrogenesis in late gestation**.** In disagreement with this study, **Carcangiu et *al.* (2017)** found significant differences in leptin concentration in milk between the two different groups of Sarda ewes which divided according to milk production to (high >1100 g/day and low <900 g/day). Adding that milk yield had an effect on the leptin levels recorded during their bathyphase. **Whitley *et al.* (2009)** found that milk leptin in ewes significantly decreased by 28-56% within 10 days of lactation, but remained steady for 20 days afterwards. **Parola *et al.* (2007)** demonstrated that there is a decline in milk leptin during the first week postpartum. **Smith and Sheffield (2002)** found that milk leptin concentrations changed significantly during lactation period, and found that milk leptin decreased during postpartum period.

In goats, during mid-lactation period, **Rosi and Rapetti (2004)** found that milk leptin concentration was twice/thrice more concentrated than that in plasma.

Hematological profile of Barki and Ossimi ewes during different physiological status.

Several studies on both breeds reveled that, physiological status, age, feeding type, sex, and season have various effects on hematological responses of animal. This can aid in diagnose of serious animal diseases that causes economic losses like reduced fur, wool and milk production which consider as important and reliable medium for assessing the animal health **(Ramprabhu *et al*., 2010 and Bhat *et al*., 2014**).

Data in table (5) show the hematological profile of both Barki and Ossimi ewes during different physiological status. In the current study, all hematological profiles were within the normal range for sheep (**Abdel-Fattah *et al.*, 2013**).

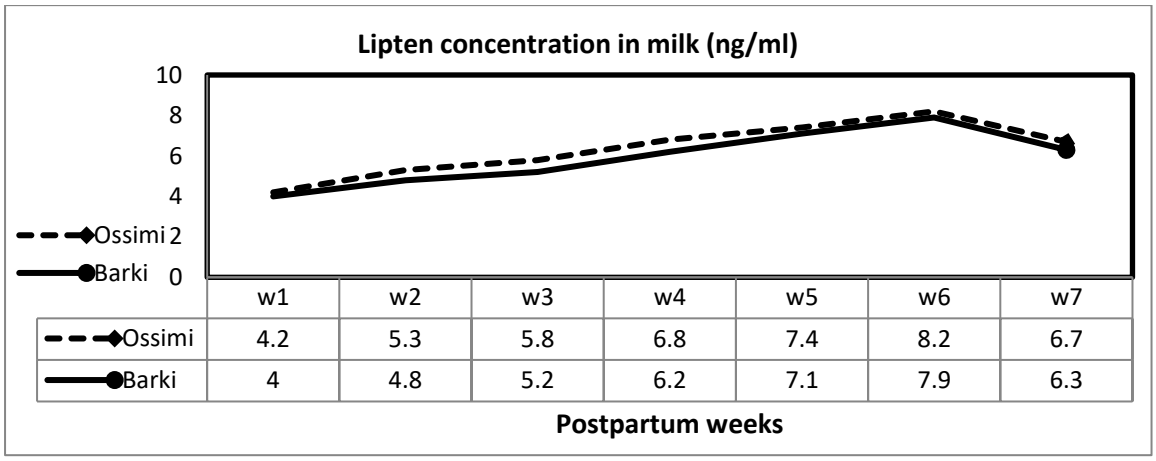

Fig.1: Change in leptin milk concentrations (ng/ml) during postpartum weeks.

Table 5: Mean values of hematological parameters of Barki and Ossimi ewes monitored during different physiological status.

Item	Breed	Physiological Status						Overall	±SE		
		Pre-mating	Pre-partum	Days post-partum							
				1 days	15 days	30 days	45 days		Br	S	Br x S
RBCs x10⁶/µL	**Barki**	9.20^{bc}	10.30^{b}	10.19^{ab}	10.57^{b}	10.03^{ab}	9.85^{bc}	10.02^{A}	0.27**	0.48**	0.68NS
	Ossimi	7.09^{c}	11.38^{a}	11.70^{a}	8.06^{c}	7.47^{c}	8.62^{c}	9.05^{B}			
WBCs x103/µL	**Barki**	10.16	9.64	11.80	10.79	10.60	12.55	10.93	0.54NS	0.93NS	1.32NS
	Ossimi	13.17	9.76	12.06	11.57	11.31	10.78	11.44			
Hematocrit, (Ht)%	**Barki**	33.00^{a}	31.50^{b}	31.00^{b}	31.00^{b}	30.75^{b}	30.25^{b}	31.25	0.52NS	0.90*	1.27NS
	Ossimi	31.50^{b}	31.25^{b}	34.50^{a}	27.75^{c}	28.25^{c}	29.00^{c}	30.38			
Hb g/dl	**Barki**	8.38	9.33	10.14	8.22	8.38	8.15	8.77	0.30NS	0.52NS	0.74NS
	Ossimi	9.82	8.46	9.38	8.40	8.40	7.84	8.72			
MCV fl	**Barki**	37.68	30.79	30.97	29.91	31.63	30.99	31.99^{B}	1.11*	1.93NS	2.73 NS
	Ossimi	46.10	27.76	30.11	36.24	39.28	33.81	35.55^{A}			
MCH pg	**Barki**	9.23^{bc}	9.11^{bc}	10.32^{bc}	7.86^{c}	8.50^{bc}	8.37^{bc}	8.90^{B}	0.34**	0.59**	0.84**
	Ossimi	14.32^{a}	7.47^{c}	8.12^{c}	10.94^{b}	11.74^{ab}	9.11^{bc}	10.28^{A}			
MCHC%	**Barki**	25.47	29.52	33.16	26.67	27.44	26.91	28.20	1.07NS	1.86NS	2.63NS
	Ossimi	31.19	27.28	27.34	30.31	29.79	27.35	28.88			

*, P<0.05, **, P<0.01, NS, non-significant, a, b,c, =Values in the same column or row within certain trait with different super scripts are significantly differed (P< 0.05), *A, B* = Values with different letters on the same column differ at (P<0.05).
RBCs: erythrocytes cell counts, WBCs: white blood cells, Ht: hematocrit, Hb: hemoglobin, MCV: mean corpuscular volume, MCH: mean corpuscular hemoglobin, MCHC: mean corpuscular hemoglobin concentration, Br=breed, S = physiological status and Br x S= breed x physiological status.

The overall mean of RBCs of Barki ewes was significantly (P<0.05) higher than that found in Ossimi ewes during different physiological status, while, both MCV and MCH were significantly (P<0.05) higher in Ossimi than Barki ewes. The effect of breed was highly significant for RBCs, MCV and MCH, while, effect of physiological status was highly significant for RBCs, Ht % and MCH and the differences due to the interaction between breed and physiological status were significant (P<0.05) for only MCH.

In the Egyptian local sheep breeds, **Anwar *et al.* (2012**) pointed great variations in the hematological and biochemical parameters and found significant breed differences in hematological parameters during the first week of lactation. Adding to that, increasing RBCs concentration after parturition probably due to the higher demand for oxygen and the requirements of higher metabolic rate.

In Ossimi ewes, **Soliman (2014)** found that physiological status caused significant (P < 0.05) changes in haematological parameters, where Hb and RBCs count were higher at late pregnancy compared to early lactation period. In sheep, when intensively grazed, **Brito *et al.* (2006)** found no variation in hematological parameters between different physiological status of non-pregnant, pregnant and lactation.

Blood plasma constituents for Barki and Ossimi ewes during different physiological status.

The results presented in Table (6) show the changes in blood biochemical parameters as influenced by physiological status of Barki and Ossimi ewes.

Data indicate that, no significant differences found between the two breeds in blood parameters except for total lipids which was higher in Ossimi than Barki (P<0.01). This might refer to the absence of fat tail in Barki sheep compare to Ossimi sheep and possibility that accumulation of fatty acids in the fat tail of Ossimi sheep reduce the availability of free lipids in the blood. Effect of physiological stages were mostly non-significant unless between pre-mating and pre-partum for total protein in Barki, and pre-partum and day 15th postpartum for total protein in Ossimi. ALP showed significant more differences on physiological stages for the two breeds. The interaction between breed and physiological status was significant (P<0.05) for total protein and alkaline phosphatase only. Ossimi' ewes showed a relatively high overall mean values for glucose concentration than that found for Barki ewes (44.49 vs. 41.66 mg/dl), but the difference was not significant. Also, the physiological status significantly (P<0.05) affected albumin /globulin ratio.

In sheep, **Brito *et al.* (2006**) mentioned that the end of gestation and the beginning of lactation consider critical periods where most changes in serum metabolic profile have detected. **Baumgartner and Pernthaner (1994)** found a non-significant effect for the reproduction stage on serum total protein concentration. During pregnancy and postpartum periods, **Farghaly et *al.* (2011)** found no significant variation due to breed (Ossimi and Rahmani) on plasma total protein, albumin, and globulin and A/G ratio. The obtained results are in agreement with **El-Ghoneimy (1994**) who reported non-significant differences due to breed of sheep in total protein. In the same trend, the results are in agreement with the finding of **El-Sheikh *et al.* (1981)** that there were no significant differences due to breed of sheep (Ossimi, Rahmani or Barki) in plasma albumin, globulin and A/G ratio. **Shetaewi and Daghash** (**1993**) found that, differences between mean levels of protein fractions of lactated Egyptian coarse wool ewes were non-significant.

However, **Samak *et al.* (1986**) found that Barki and Rahmani ewes had significant difference in albumin concentration.

The present result is in consistent also with, **Hashem and EL-Zarkouny (2016)** who found that breed type (Rahmani vs. Barki) showed significant differences (p<0.05) in concentrations of serum glucose, total protein, triglycerides and insulin, while no differences observed between the two breeds in the concentrations of serum urea and T_3 hormone. .

In Ossimi sheep, **Soliman (2014)** found that physiological status had a significant (P<0.05) differences in serum concentration of total protein. Also, **Safsaf *et al.* (2012)** revealed higher concentrations of serum total protein in non-pregnant ewes compared to the late - pregnant ones. They attributed the reduction in total protein in late–pregnancy to that foetus synthesizes all its proteins from the amino acids derived from the mother, and that foetus growth increases exponentially reaching a maximum level, especially in muscles, during late pregnancy.

In late pregnant Ossimi ewes, **Soliman (2014)** found a significant (P<0.05) increase in serum albumin and a significant (P<0.05) decrease in globulin concentrations compared to lactating ones. The increase of albumin in late gestation proves the high-energy requirement of fetal growth **(Durak and Altiner, 2006).**

In late pregnancy and early lactation periods for sheep, **Soliman (2014) and Antunovic et *al.* (2011)** found a significant (P<0.01) decrease in serum glucose compared with non–pregnant ones. They attributed these results to the constant energy loss accompanied the milk synthesis. Meanwhile, the low glucose level during high pregnancy associate with fetus development and mobilization of maternal glucose to fetal blood circulation (**Jacob and Vadodaria, 2001)**.

Table 6: Mean values of blood parameters of Barki and Ossimi ewes monitored during different physiological status.

Item	Breed	Physiological Status						Overall	±SE		
		Pre-mating	Pre-partum	Post-partum (day)							
				1	15	30	45		Br	S	Br x S
Total Protein g/dl	Barki	5.34	6.30	6.66	6.48	6.05	6.02	**6.14**	0.12 NS	0.21 NS	0.29 *
	Ossimi	6.57	6.03	6.09	5.76	6.11	5.86	**6.07**			
	Overall	**5.96**	**6.16**	**6.38**	**6.13**	**6.08**	**5.94**				
Albumin, g/dl	Barki	3.24	3.21	3.19	3.10	3.01	3.33	**3.18**	0.10 NS	0.17 NS	0.22 NS
	Ossimi	3.76	2.68	2.90	3.04	3.04	3.10	**3.09**			
	Overall	**3.50**	**2.95**	**3.06**	**3.07**	**3.04**	**3.22**				
Globulin, g/dl	Barki	2.11	3.09	3.47	3.38	3.02	2.69	**2.96**	0.11 NS	0.20 NS	0.28 NS
	Ossimi	2.81	3.35	2.91	2.74	3.07	2.76	**2.94**			
	Overall	**2.46**	**3.23**	**3.19**	**3.06**	**3.04**	**2.72**				
A/G ratio	Barki	1.53	1.05	0.94	0.94	1.12	1.28	**1.14**	0.05 NS	0.09 **	0.12 NS
	Ossimi	1.36	0.80	1.01	1.14	1.09	1.16	**1.09**			
	Overall	**1.45^{A}**	**0.93^{C}**	**0.98^{BC}**	**1.04^{BC}**	**1.10^{BC}**	**1.22^{AB}**				
Glucose mg/dl,	Barki	41.87	51.88	39.39	42.56	43.13	48.16	**44.49**	1.44 NS	2.51 NS	3.55 NS
	Ossimi	38.12	40.99	42.35	45.67	42.92	39.90	**41.66**			
	Overall	**39.99**	**46.44**	**40.87**	**44.12**	**43.03**	**44.03**				
Total Lipids, g/l	Barki	2.75	3.39	2.59	2.67	3.00	3.23	**2.95^{A}**	0.09 **	0.16 NS	0.22 NS
	Ossimi	2.65	2.80	3.32	2.51	2.72	2.54	**2.59^{B}**			
	Overall	**2.70**	**3.09**	**2.46**	**2.64**	**2.86**	**2.89**				
Cholesterol, g/dl	Barki	97.90	105.67	92.11	92.23	93.71	**98.29**	**96.65**	1.55 NS	2.69 NS	3.80 NS
	Ossimi	92.63	98.97	90.99	93.92	95.88	**95.51**	**94.64**			
	Overall	**95.26**	**102.32**	**91.55**	**93.07**	**94.79**	**96.90**				
Urea, mg/dl	Barki	39.71	45.23	37.36	37.68	40.10	42.76	**40.48**	0.92NS	1.60NS	2.26NS
	Ossimi	34.82	39.46	37.82	44.30	39.96	38.56	**39.15**			
	Overall	**37.27**	**42.37**	**37.59**	**40.99**	**40.02**	**40.67**				
Creatinine, mg/dl	Barki	1.21	1.65	1.14	1.18	1.41	1.58	**1.36**	0.07NS	0.12NS	0.18NS
	Ossimi	1.16	1.24	1.05	1.36	1.31	1.27	**1.23**			
	Overall	**1.18**	**1.44**	**1.10**	**1.28**	**1.36**	**1.42**				
AST, IU/L	Barki	30.96	28.08	29.13	23.88	28.69	26.21	**27.82**	1.86NS	3.23NS	4.56NS
	Ossimi	43.56	23.58	37.00	29.11	29.10	34.99	**32.88**			
	Overall	**37.26**	**25.83**	**33.07**	**26.49**	**28.89**	**30.57**				
ALT, IU/L	Barki	25.61	25.52	24.10	22.70	23.97	25.20	**24.52**	0.77NS	1.33NS	1.87NS
	Ossimi	29.66	25.26	25.61	23.41	25.12	25.10	**25.59**			
	Overall	**27.63**	**25.39**	**24.85**	**23.06**	**24.54**	**25.15**				
ALP, IU/L	Barki	182.8a	147.1	171.9	131.9	134.3	138.0	**151.0**	2.10NS	3.64**	5.15*
	Ossimi	185.4a	146.9	161.2	133.5	140.5	142.4	**151.7**			
	Overall	**184.1^{A}**	**147.0^{C}**	**166.4^{B}**	**132.7^{D}**	**137.4^{CD}**	**140.2^{CD}**				

*, P<0.05, **, P<0.01, NS, non-significant, *A, B* = Values with different letters on the same column differ at (P<0.05). Br=breed, S = physiological status and Br x S= breed x physiological status.

Soliman (2014) found that serum total lipids showed significant (P<0.05) increase in late -pregnant and early lactating Ossimi ewes compared to non -pregnant ewes**.** The elevation of free fatty acids (FFA) level in pregnant than non -pregnant ewes, caused by increasing cortisol level as a result of stress induced by pregnancy (**Fleming, 1997**). Additionally, the increased sensitivity of ewes to epinephrine hormone leads to an increase in serum FFA concentrations in late-pregnancy (**Revell *et al.*, 2000)**.

Soliman (2014) found that the highest serum urea (P<0.05) during late-pregnancy followed by early-lactation then non-pregnancy. In Barki ewes, **El-Sherif and Assad (2001**) found that blood urea started rising during week 10 of pregnancy and reached a peak around parturition.

The hormonal pattern in blood during different physiological status for Ossimi and Barki ewes:

A- Insulin concentrations:

Insulin is a small globular protein, which synthesized and secreted from the pancreatic – cells in all species (**González and Silva, 2006**). In ruminants, due to microbial activity in the rumen, little or no dietary carbohydrate is absorbed as hexose sugar in the small intestine (**Mcniven, 1984**). For this reason, volatile fatty acids (pro-pionate and butyrate) are more potent than glucose for stimulating insulin secretion (**González and Silva, 2006**).

Fig. (2) show that Ossimi ewes, had higher level (p<0.05) of insulin concentrations than Barki ewes, since the overall means were 18.05 vs. 16.52 µIU/ml in Ossimi and Barki ewes,

respectively. The mean levels of insulin concentrations slightly increased until day 1 then faster increase from day 15th to day 45th.

Abdel-Moneim (2009) attributed these results to better hepatic gluconeogenesis and thus improved glucose level in Ossimi breed. Additionally, **Sasaki, Shin-ichi (2002)** mentioned that a higher level of glucose in blood might due to increased insulin resistant in muscles and adipose-tissues which reflect other adaptation mechanism in ruminate. **Hashem and EL-Zarkouny (2016)** found that Rahmani ewes had greater ($p<0.05$) overall concentrations of insulin than Barki ewes.

Antunovic *et al.* (2011) reported that concentrations of insulin showed significant changes at different physiological stages. **Vernon *et al.* (1981)** stated that the fall in insulin levels is associated with a concomitant decrease in the insulin receptors of the adiposities, which is responsible of mobilization during late pregnancy. While, during postpartum period hypoinsulinemia attributed to the continued mobilization during lactation as insulin removed by the mammary gland. However, in disagreement with this study, **Teleb *et al.* (2014)** found a significant increase in insulin concentration at pre-mating period than that at late pregnancy and postpartum/suckling periods. While, **Suganya and Gomathy (2009)** reported a decrease in insulin levels in goats during gestation until kidding compared to non–pregnant one, which remained low till 10 days postpartum then increased.

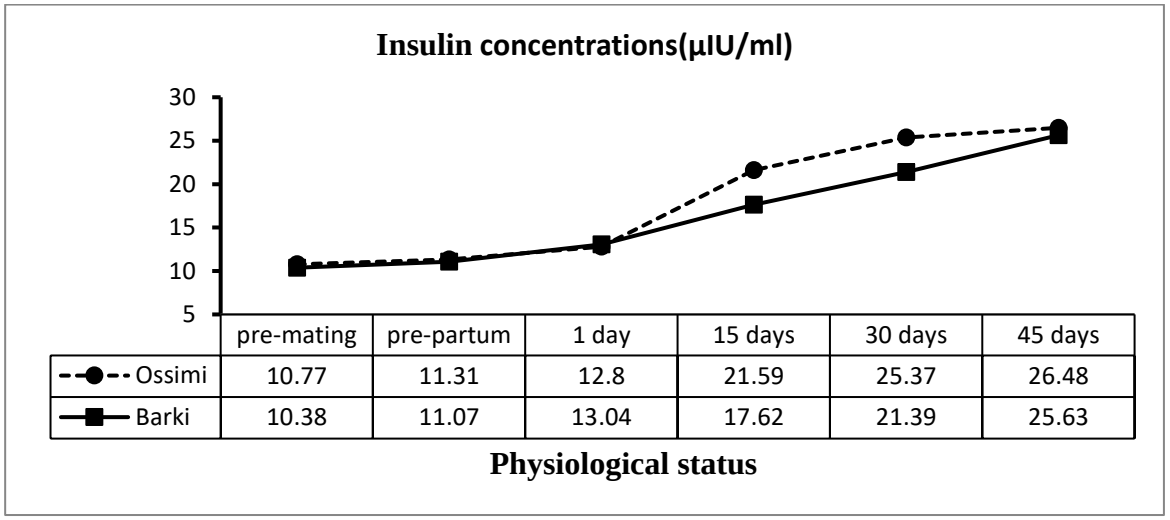

Fig.2: Change in insulin concentrations (µIU/ml) during different physiological status.

B- Thyroid hormones:

During different physiological stages (pregnancy and lactation periods of animal life) thyroid hormones play an important role, as they involved in the metabolic response via maintaining the homeostasis of energy and protein metabolism, thermoregulation, growth and productive parameters **(Huszenicza *et al.*, 2002).** Monitoring the concentration of blood parameters as well as thyroid hormones in sheep gives a clear picture of their nutritional and health status before the changes are visible on the animal (**Antunovic *et al.*, 2009).** Recognizing the normal values would be the useful index for determination of the physiological aspects in various physiological status including non-pregnant or pregnant ewes. Moreover, **Escobar (2001)** stated that the mother is the only source of T3 and T4 up to the moment that the thyroid tissue becomes active in the fetus and plays its role in organogenesis and in the development of placenta.

Figs. (3 and 4) show the plasma thyroid hormones (T_3 and T_4) levels for Ossimi and Barki ewes at different physiological status. Data show that the breed type and physiological status had a significant ($P<0.05$) effect on thyroid hormones, especially thyroxin concentration, as Ossimi ewes had higher overall mean values of T_3 and T_4 (1.76 and 40.14ug/dl) than Barki (1.67

and 38.20 ug/dl), respectively. In agreement with present study, **Soliman (2014)** reported on Ossimi that physiological status had a significant ($P<0.05$) effect on the thyroid hormone concentration**. Antunovic *et al.* (2011)** reported that concentrations of thyroid hormones in the blood of ewes at different physiological stages have visible significant changes with most studied parameters. Also, **Kudari (1992)** concluded that secretion rates of T_3 and T_4 have been reported to be affected by the reproductive status. While, **Novoselec *et al.* (2009)** observed non-significant differences in T_4 levels due to reproductive status of sheep. The results of this study disagree with **Hashem and EL-Zarkouny (2016)** who found no differences between the two breeds (Rahmani and Barki ewes) in the concentration of serum T_3 hormone. **Farghaly *et al.* (2011)** found no significant variation due to the effect of breed, but a highly significant variation was found due to the effect of days of pregnancy on T_3 and T_4 concentrations.

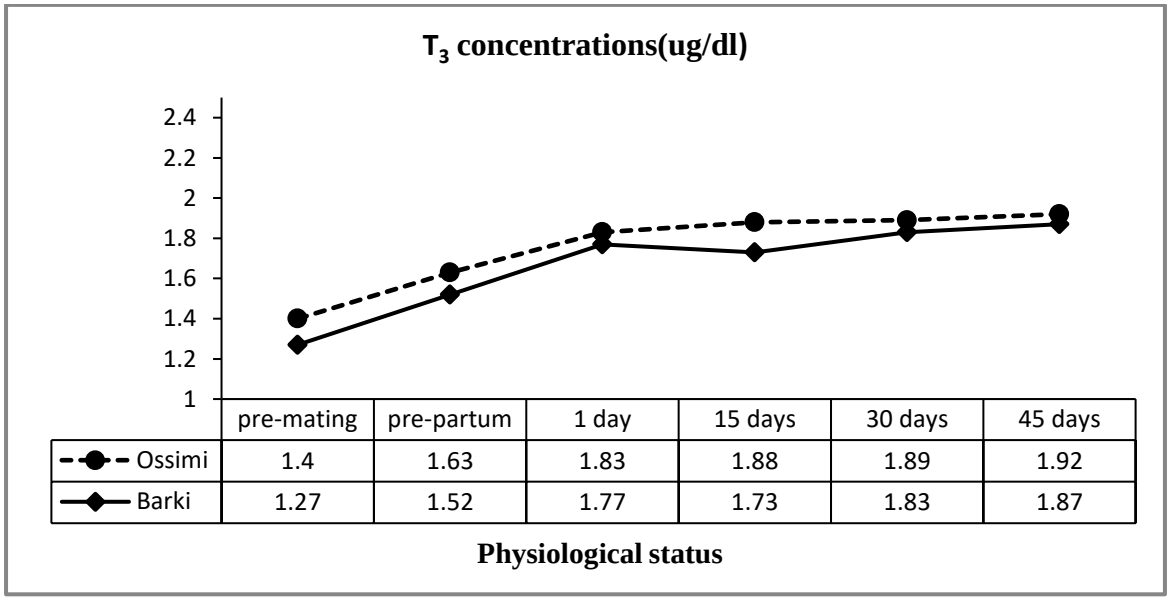

Fig.3: Change in triiodothyronine (T_3 ug/dl) concentrations during different physiological status.

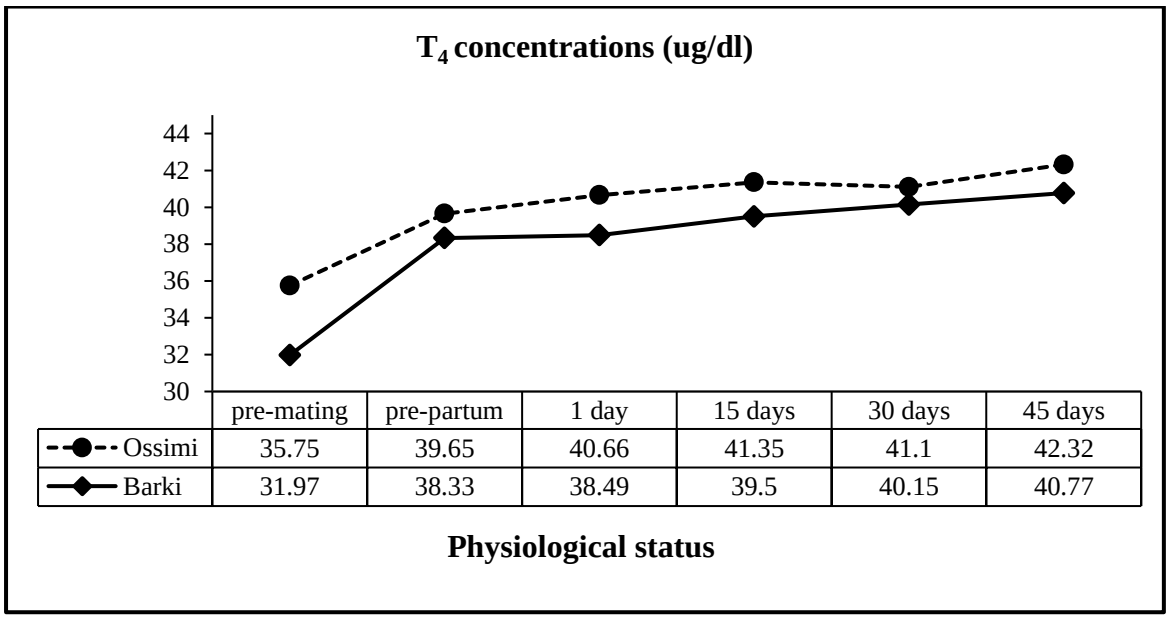

Fig.4: Change in thyroxin (T_4 ug/dl) concentrations during different physiological status.

These results attributed to the different level of metabolic activity throughout the pregnancy period which depends on the different embryonic needs at different stages of embryonic development. Several authors (**Nathanielsz *et al.*, 1973 a&b**) mentioned that during pregnancy plasma T_4 levels varied significantly from 2.3 to 4.1 g/100 ml during the 103 days of gestation and the day of birth, while the T_3 concentration continued to rise during this period until thyroxin concentration fall. **Salem *et al*. (1986)** reported that during late pregnancy thyroid gland secretion raises than that found in the early stage of pregnancy. Contrarily, **Soliman (2014)** found that concentrations of T_3 and T_4 in Ossimi ewes were significantly ($P<0.01$) lower at late-pregnancy of ewes compared to those at early-lactation. **Khaled and Illek (2012)** compared the response of thyroid hormones to the physiological status of Ossimi and Barki ewes, and found that concentrations of T_3 and T_4 significantly declined in last month of pregnancy and post-partum compared to early lactation. These results led to alteration in cardiac output and increase blood volume. In Saidi ewes, during different reproductive status, **Teleb *et al.* (2014)** reported that serum T_3 and T_4 levels were significantly lower ($P<0.001$) at late pregnancy compared to pre-mating. In addition, at postpartum and suckling periods, T_4 concentration decreased significantly ($P<0.001$). Meanwhile, **Okab *et al.* (1993)** reported that plasma T_3 and T_4 levels of sheep were lower during postpartum and suckling periods with respect to gestation period. In goats, **Suganya and Gomathy (2009)** reported a decline in serum T_3 and T_4 concentrations prior to kidding, reached the lowest levels at kidding, then increased up to 15 days postpartum. Similar results reported by **Eswari *et al*. (1999)** on sheep. **Colodel *et al.* (2010)** suggested that the low concentrations of T3 and T4, observed during gestation in ewes, could related to the passage of thyroid hormones through the placenta, since the ovine thyroid becomes functional only between the 6^{th} and 8^{th} weeks of embryonic life.

C- Plasma Leptin concentration:

Leptin is a protein hormone synthesized in the placenta at comparable or greater levels than in adipose tissue, regulated by multiple hormones including insulin, Insulin-like growth factor 1 (IGF-I) and somatotropin **(Smith and Sheffield, 2002)**. It played an important role on some functions such as mammary gland, appetite regulation, feed intake, energy deposition and participates in the co-ordination of metabolism during the transition from pregnancy to lactation. More than that, it influences growth and fat accumulation, **(Daniel *et al.*, 2013). Rosales Nieto *et al*. (2013)** noticed improvement of reproductive performance **(**It may function as a growth factor for the fetus, signaling nutritional status from the mother to her offspring **(Masuzaki *et al.*, 1997).** It may play a role as a signal to central nerves system indicating energy status of the animal (**Block *et al.*, 2001).**

The mean leptin concentrations in Ossimi and Barki ewes are shown in (Fig. 5). Ossimi ewes showed higher leptin concentrations than Barki ewes during different physiological stages and the differences were significant ($P<0.05$). Both breeds followed the same variation trend for leptin concentrations, which ranged from 5.88 to 7.11 ng/ml for Ossimi and from 5.25 to 6.12 ng/ml for Barki. **Comba *et al.* (2016)** tested leptin level in four breeds of sheep and found it significantly ($P <0.05$) differ. **Bartha *et al.* (2005)** reported that the reduction in the plasma leptin level caused by a decrease in its secretion by the adipose tissue in the early lactation period, because leptin signals from the periphery to the CNS inform about the total fat deposit of the body and control the feed intake and energy expenditure.

Woodside *et al.* (2000) reported that transition from pregnancy to lactation showed a reduction in plasma concentration of leptin. **Rollin *et al.* (2010**) mentioned that physiological status (pregnancy and lactation) had a significant effect on the metabolic profile because they characterize by a great metabolic stress. Adding to that, during pregnancy period, **Ehrhardt *et al.* (2001)** found that leptin concentration increased significantly due to the production of leptin by the placenta and refer that to the wellbeing of the

fetus. **Blok *et al.* (2001)** recorded an increase in level of circulating leptin from early and mid-pregnancy until late pregnancy in sheep and attributed that to increase of adiposity where increase of leptin mRNA exhibited in adipose tissues. **Henson *et al,* (1998)** mentioned that plasma leptin significantly elevated during late pregnancy than early pregnancy as placenta start synthesis of leptin. Leptin level increased from early to late pregnancy in primiparous goats (**Bonnet *et al.*,2005**) and from mid to late pregnancy in sheep (**Forhead *et al.*, 2008**) which reveled to that circulating leptin levels increased by 2 folds and remained elevated until late pregnancy then declined thereafter through late pregnancy and early lactation (**Ehrhardt *et al.*, 2002**).

Antunović *et al.* (2010) found that leptin concentration in the blood of fattening lambs was significantly (P<0.01) higher than that found in suckling lambs (4.83 and 3.45 ng/mL, respectively). **Antunovic *et al.* (2011)** reported that the physiological status had significant effect on the serum concentration of leptin, where ewes showed higher concentration of leptin during pregnancy than during lactation. **Tokuda *et al.* (2002)** mentioned that serum leptin is sensitive to energy balance and it reduces during periods of negative energy balance in ewes such as (lactation period) which associate with marked loss of energy during lactation, which could not fully compensate by food intake **(Maèajova *et al.*, 2004).** During late pregnancy, plasma leptin levels increase **(Tamura *et al.*, 1998),** then decreased sharply after delivery. **McFadin *et al.* (2002)** found that plasma leptin level, in ewes, was lower during early lactation compared with late pregnancy**.**

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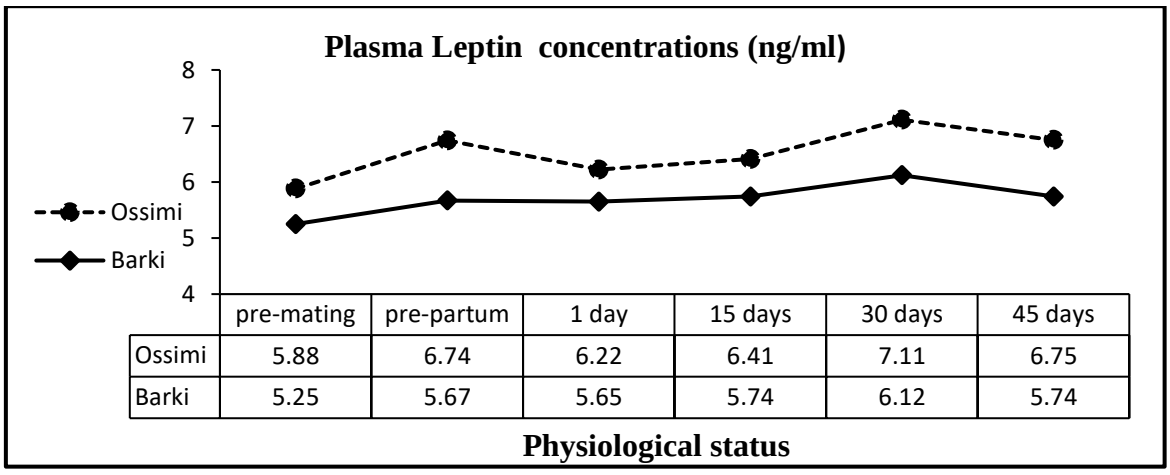

	pre-mating	pre-partum	1 day	15 days	30 days	45 days
Ossimi	5.88	6.74	6.22	6.41	7.11	6.75
Barki	5.25	5.67	5.65	5.74	6.12	5.74

Fig.5: Change in plasma leptin (ng/ml) concentrations during different physiological status.

In Awassi ewes, **Temizel *et al.* (2018)** found different concentrations (P< 0.05) in leptin during pregnancy and non-pregnancy of ewes (4.5 and 3.4 ng/mL, respectively). While leptin level tended to decrease during lactation period, which might relate to changes in adipose tissue density, as response to parturition in sheep and /or could associate to the negative energy balance resulted from increasing metabolic requirements just after parturition. The variations in serum leptin might use to monitor metabolic adaptation during lactation. Also, **Carcangiu *et al.* (2017**) indicated a decrease in plasma leptin concentration in sheep postpartum.

In Awassi lambs, **Zarkawi and Al-Daker (2018)** recognized no individual variations in leptin concentration with no clear trend between high and low growing groups.

In dairy goats, **Rasmussen *et al.* (2004)** found that pre-partum plasma leptin concentration was higher than postpartum (P<0.05), as it decreased at parturition and during the first few days of lactation. **Shikh Maidin *et al.* (2014)** found that leptin concentration was increased (p < 0.05) by supplementing lupin grain to ration than that found in control one. **Devrim *et al.* (2015**) found that leptin level increased significantly nearly at 4th and 8th months of age in the females of

native Hair ($p<0.05$) and Honamlı goats ($p<0.001$) where it ranged from 21.25±0.72 and 35.38±3.44 to 20.01±1.60 and 30.89±3.74, respectively. While, **Walker *et al*. (2011)** found leptin level below 10 ng/mL. However, these differences could be arising from the impact of nutritional conditions and the age of animals.

In disagreement with these results, **Catunda *et al.* (2013)** reported that effect of breed (Morada Nova and Santa Ines) was not significant on blood leptin and that its concentration was low in hair sheep raised in tropical climate, but the dietary supplementation positively affected blood leptin concentrations in these breeds, though there was no major effect on the reproductive processes. **Soliman *et al*. (2002)** showed a relatively constant serum leptin level during the pre-partum period.

Reproductive parameters:

A- Estrous characteristics:

Results in Table, (7) indicate that estrus duration significantly ($P<0.05$) reduced in Ossimi ewes compared to Barki one (34.40 vs. 36.90 h, respectively). Ossimi ewes had significantly ($P \leq 0.05$) higher estrus rate than that found for Barki ewes (95.0 vs. 85.0%, respectively). Onset of estrous and day of estrous showed decreased values with Ossimi ewes comparable to Barki one (12.64 vs.14.46 and 3.29 vs. 4.91, respectively). Non-return rate also followed the same trend as Ossimi ewes had less value than Barki ewes (78.95 vs. 88.24%, respectively).

Table7: Estrous characteristics of Barki and Ossimi ewes.

Items	Breed		Sig.
	Barki	Ossimi	
Number of ewes	20	20	
Estrous response number (%)	17	19	
Estrus rate (%)	17/20 (85.0%)^{b}	19/20 (95.0%)^{a}	*
Duration of estrous (h)	36.90 ^{a} ±0.76	34.40 ^{b} ±0.76	*
Onset of estrous (d)	14.46^{a}± 1.03	12.64^{b}± 0.78	*
Day of estrous (d)	4.91^{a}± 0.45	3.29^{b}± 0.19	*
Non-return to estrous (ewes)(%)	15/17(88.24%)^{a}	15/19(78.95%)^{b}	*

a, b and c,values in the same row with different superscripts are significantly different ($P<0.05$)

Table 8: Ovarian activity of Barki and Ossimi ewes (difference between individuals of the two breeds)**.**

Items	Breed		Sig.
	Barki	Ossimi	
Ovarian follicles dimeters			
Small (≤ 2 mm)	0.60±0.09	1.10±0.11	NS
Medium (> 2 < 4 mm)	0.80±0.10	1.00±0.12	NS
Large (≥ 4mm)	1.10±0.13	1.50±0.14	NS
Total follicles	2.50±0.34	3.60±0.33	NS
Dominant follicle diameters (mm)	5.90^{b}± 0.12	6.60 ^{a} ±0.12	*
Numbers of corpus luteum	1.60±0.15	1.90±0.15	NS
Corpus luteum diameters (mm)	6.54^{b} ±0.15	7.99 ^{a} ±0.15	**

a, b and c, values in the same row with different superscripts are significantly different ($P<0.05$)

A- Ovarian activity:

Data in Table (8) illustrate the difference between individuals of the two breeds in numbers of follicles of different diameters and corpus luteum (CL), which counted post mating. There were no significant differences in number of follicles (2.50 vs. 3.60) and CL (1.6 vs.1.9) due to type of breed. However, Ossimi ewes, compared to Barki ewes, showed a greater diameter ($P<0.05$) for dominant follicles (6.60 vs.5.90 mm) and CL (7.99 vs.6.54 mm), respectively.

B- Reproductive performance:

Data in Table (9) clearly indicate that Ossimi ewes significantly (P≤0.05) had better conception rate, fecundity, kidding rate, reproductive ability, kids born per ewes joined, ewes aborted/ewes conceived, twining frequency (most probably due to inherent factors) and kids weaned/kids kidded as compared to Barki ewes. While the type of breed insignificantly affected on fertility. Survival rate of kids, from birth to weaning, was higher with Ossimi ewes compared to Barki ewes. It could be seen that, Ossimi ewes had significantly (P<0.05) longer pregnancy period than Barki ewes (150.44 vs.148.88 days, respectively). These results are close to those obtained by **El-Sayed (1988)** who found that the length of gestation was 151.68±0.50 days in Ossimi ewes. However, it could observe that, though both breeds resumed their ovarian activity within the same time, only Ossimi ewes showed better reproductive performance (higher conception and fecundity rates). In Ossimi sheep, **Mohamed and Abd El-Hakeam (2017)** found a significant (P<0.05) increase in estrus duration, litter size and fecundity, but no significant increase noticed in estrus rate, non-return rate, lambing rate and twinning rate in treated ewes compared to the control one.

Table 9: Reproductive traits of Barki and Ossimi ewes.

Traits	Breeds		Sig
	Barki	Ossimi	
Number of ewes joined with ram	20	20	
Gestation length (days)	148.88±0.15	150.44±0.21	*
Conception rate (%)	17/20 (85.0%)[b]	19/20 (95.0%)[a]	*
Fertility, ewes kidded / ewes joined	15/20(75.0%)	15/20(75.0%)	NS
Ewes kidded/ ewes conceived, (%)	15/17 (88.24%)[a]	15/19 (78.95%)[b]	*
Ewes aborted / ewes conceived, (%)	2/17(11.76%)[b]	4/19(21.05%)[a]	*
Fecundity, kids born/ewes joined, (%)	16/20(80.0%) [b]	17/20(85.0 %) [a]	*
Kids born per ewe joined, (%)	16:20 (0.80) [b]	17:20(0.85[a])	*
Kidding rate, kids born/ewes Kidded, (%)	16/15(106.67%)[b]	17/15(113.33%)[a]	*
Kids born per ewe kidded	16/15 (1.06)[b]	17/15(1.13)[a]	*
Twining frequency, (%)	1/15(6.6%)[b]	2/15(13.33%)[a]	*
Number of viable kids at weaning	14	17	
Reproductive ability (kids weaned/ewes joined), %	14/20(70.0%)[b]	17/20(85.0%)[a]	*
Kids weaned/ewes kidded, (%)	14/15(93.33%)[b]	17/15(113.33%)[a]	*
Survival rate of kids from birth to weaning %	14/16(87.5%)	17/17 (100%)	

a, b and c, values in the same row with different superscripts are significantly different (P<0.05)

The results of this study show a higher twinning frequency percentage for Ossimi ewes (most probably due to inherent factors) which clearly indicates their superiority over Barki ewes in terms of reproduction performance.

In conclusion, on the base of the foregoing results, this study indicates that, Ossimi ewes has better productive and reproductive performance under the Egyptian conditions, represented in significant (P<0.05) heavier live body weight and better reproductive performance compared to Barki one.

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